

WHAT IS CLAIMED IS:

1. A light beam scanning apparatus comprising:  
light beam generating means for generating a light  
beam and being able to change its output luminous  
5 energy;

scanning means for scanning a scan surface with  
the light beam generated at the light beam generating  
means;

10 light sensing means for sensing the light beam  
directed by said scanning means and outputting a light  
sense signal corresponding to the luminous energy of  
the light beam;

15 light beam luminous energy sensing means which  
senses the luminous energy of said light beam on the  
basis of said light sense signal outputted from said  
light sensing means and includes adjusting means for  
adjusting more than one unit of said light beam  
scanning apparatus so that their luminous energy  
sensing characteristics may be equalized; and

20 light beam luminous energy control means for  
controlling the luminous energy of said light beam  
generating means on the basis of the sensing result of  
the light beam luminous energy sensing means so that  
the luminous energy of the light beam scanning said  
25 scan surface may have a specific value.

2. The light beam scanning apparatus according to  
claim 1, wherein

said light sensing means outputs current according to the amount of light,

said light beam luminous energy sensing means includes current/voltage conversion means for  
5 converting the current outputted from said light sensing means into a voltage and integration means for integrating the output voltage signal from said adjusting means, and

said adjusting means is a variable resistor for  
10 varying the integration constant of said integration means.

3. The light beam scanning apparatus according to claim 2, further comprising

control means for controlling said apparatus  
15 comprehensively, wherein

said current/voltage conversion means has a signal amplification factor setting section controlled by said control means.

4. The light beam scanning apparatus according to  
20 claim 1, further comprising

an image retaining member on whose surface an electrostatic latent image is formed by the scanning of said scanning means,

a developing unit for developing the electrostatic  
25 latent image formed on said image retaining member to form a toner image, and

a transfer unit for transferring said toner image

onto a sheet of paper, wherein

more than one unit of said light beam generating means is provided, and

said scanning means scans said scan surface  
5 simultaneously with the light beams generated by said plural light beam generating means.

5. The light beam scanning apparatus according to claim 1, further comprising

an image retaining member on whose surface an  
10 electrostatic latent image is formed by the scanning of said scanning means,

a developing unit for developing the electrostatic latent image formed on said image retaining member to form a toner image, and

15 a transfer unit for transferring said toner image onto a sheet of paper, wherein

more than one unit of said light beam generating means is provided, and

said scanning means scans said scan surface  
20 simultaneously with the light beams generated by said plural light beam generating means, and wherein said light beam scanning apparatus further comprising

light beam position sensing means for sensing the passing positions of the light beams in the direction  
25 perpendicular to the direction in which the light beams scan, the light beams being directed by the scanning means so that they may scan the surface of said image

retaining member,

malfunction sensing means for sensing that a malfunction has occurred in said plural light beam generating means, and

5 control means for stopping the light-emitting operation of the light beam generating means that has malfunctioned, when the malfunction sensing means has sensed that a malfunction has occurred in the light beam generating means, and continuing to form an image  
10 by the operation of the remaining good light beam generating means.

6. The light beam scanning apparatus according to claim 4, further comprising:

light beam position sensing means for sensing the  
15 passing positions of the light beams in the direction perpendicular to the direction in which the light beams scan, the light beams being directed by the scanning means so that they may scan the surface of said image retaining member;

20 calculation means for calculating the amount of deflection of the optical path to deflect the passing positions of said light beams to desired positions on said image retaining member on the basis of each sensing result of the light beam position sensing  
25 means;

plural optical path deflection means which are provided for said light beams respectively and are used

to change each of the passing positions of said light beams on said image retaining member on the basis of the amount of deflection of each optical path calculated at said calculation means;

5 malfunction sensing means for sensing that a malfunction has occurred in said plural light beam generating means; and

control means for stopping the light-emitting operation of the light beam generating means that has  
10 malfunctioned, when the malfunction sensing means has sensed that a malfunction has occurred in the light beam generating means, and continuing to form an image by the operation of the remaining good light beam generating means.

15 7. The light beam scanning apparatus according to claim 6, further comprising guide display means for informing the user of the apparatus of the malfunction state by displaying a guide, when said malfunction sensing means has sensed that a malfunction has  
20 occurred in the light beam generating means.

8. The light beam scanning apparatus according to claim 6, further comprising control means for, when said malfunction sensing means has sensed that a malfunction has occurred in the optical path deflection  
25 means, stopping the light-emitting operation of the light beam generating means corresponding to the optical path deflection means that has malfunctioned

and causing the image formation to be continued by the operation of the remaining good optical path deflection means and the light beam generating means corresponding to the good deflection means.

5           9. The light beam scanning apparatus according to claim 6, further comprising control means for, when said malfunction sensing means has sensed that a malfunction has occurred in the light beam generating means, stopping the light-emitting operation of the  
10           light beam generating means that has malfunctioned and causing the image formation to be continued by the operation of the remaining good light beam generating means.

          10. The light beam scanning apparatus according to  
15           claim 6, further comprising:

          data conversion means for, when said malfunction sensing means has sensed that a malfunction has occurred in the optical path deflection means, converting said image data according to the number  
20           of the remaining good optical path deflection means excluding the optical deflection means that has malfunctioned; and

          control means for, when said malfunction sensing means has sensed that a malfunction has occurred in the  
25           optical path deflection means, stopping the light-emitting operation of the light beam generating means corresponding to the optical path deflection means that

has malfunctioned and causing the image formation to be continued by the operation of the remaining good optical path deflection means and the light beam generating means corresponding to the good deflection means, wherein said light beam generating means receive electric signals corresponding to said converted data.

11. The light beam scanning apparatus according to claim 6, further comprising:

light beam position sensing means for sensing the light beams directed by the scanning means so that they may scan the surface of said image retaining member by means of light sensing elements arranged in parallel at intervals corresponding to resolutions in the direction almost perpendicular to the direction in which said light beams scan;

resolution conversion means for, when said malfunction sensing means has sensed that a malfunction has occurred in the light beam generating means, converting the resolution during image formation according to the number of the remaining good light beam generating means excluding the light beam generating means that has malfunctioned; and

control means for, when said malfunction sensing means has sensed that a malfunction has occurred in the light beam generating means, stopping the light-emitting operation of the light beam generating means that has malfunctioned and causing the image formation

to be continued at the resolution converted by said resolution conversion means by the operation of the remaining good light beam generating means.

12. An image forming apparatus which forms an  
5 image on an image retaining member by causing light beams to scan and expose the surface of said image retaining member, comprising:

plural light beam generating means for generating light beams;

10 scanning means for scanning the surface of said image retaining member with the light beams generated at the plural light beam generating means;

light beam position sensing means for sensing the passing positions of the light beams in the direction  
15 perpendicular to the direction in which the light beams scan, the light beams being directed by the scanning means so that they may scan the surface of said image retaining member;

plural optical path deflection means which are  
20 provided for said light beams in a one-to-one ratio and are used to change each of the passing positions of said light beams on said image retaining member on the basis of the amount of deflection of each optical path calculated at said calculation means;

25 malfunction sensing means for sensing that a malfunction has occurred in said plural light beam generating means; and

control means for stopping the light-emitting operation of the light beam generating means that has malfunctioned, when the malfunction sensing means has sensed that a malfunction has occurred in the light  
5 beam generating means, and causing the image formation to be continued by the operation of the remaining good light beam generating means.

13. An image forming apparatus which forms an image on an image retaining member by causing light  
10 beams to scan and expose the surface of said image retaining member, comprising:

plural light beam generating means for generating light beams;

scanning means for scanning the surface of said  
15 image retaining member with the light beams generated at the plural light beam generating means;

light beam position sensing means for sensing the passing positions of the light beams in the direction perpendicular to the direction in which the light beams  
20 scan, the light beams being directed by the scanning means so that they may scan the surface of said image retaining member;

calculation means for calculating the amount of deflection of the optical path to deflect the passing  
25 positions of said light beams to desired positions on said image retaining member on the basis of each sensing result of the light beam position sensing

means;

plural optical path deflection means which are provided for said light beams in a one-to-one ratio and are used to change each of the passing positions of said light beams on said image retaining member on the basis of the amount of deflection of each optical path calculated at said calculation means;

malfunction sensing means for sensing that a malfunction has occurred in said plural light beam generating means; and

control means for stopping the light-emitting operation of the light beam generating means that has malfunctioned, when the malfunction sensing means has sensed that a malfunction has occurred in the light beam generating means, and causing the image formation to be continued by the operation of the remaining good light beam generating means.

14. The light beam scanning apparatus according to claim 13, further comprising guide display means for informing the user of the apparatus of the abnormal state by displaying a guide, when said malfunction sensing means has sensed that a malfunction has occurred in the light beam generating means.

15. The light beam scanning apparatus according to claim 13, further comprising control means for, when said malfunction sensing means has sensed that a malfunction has occurred in the optical path deflection

means, stopping the light-emitting operation of the  
light beam generating means corresponding to the  
optical path deflection means that has malfunctioned  
and causing the image formation to be continued by the  
5 operation of the remaining good optical path deflection  
means and the light beam generating means corresponding  
to the good deflection means.

16. The light beam scanning apparatus according to  
claim 13, further comprising control means for, when  
10 said malfunction sensing means has sensed that a  
malfunction has occurred in the light beam generating  
means, stopping the light-emitting operation of the  
light beam generating means that has malfunctioned and  
causing the image formation to be continued by the  
15 operation of the remaining good light beam generating  
means, wherein said light beam generating means receive  
electric signals corresponding to said converted data.

17. The light beam scanning apparatus according to  
claim 13, further comprising:

20 data conversion means for, when said malfunction  
sensing means has sensed that a malfunction has  
occurred in the optical path deflection means,  
converting said image data according to the number of  
the remaining good optical path deflection means  
25 excluding the optical deflection means that has  
malfunctioned; and

control means for, when said malfunction sensing

means has sensed that a malfunction has occurred in the optical path deflection means, stopping the light-emitting operation of the light beam generating means corresponding to the optical path deflection means that has malfunctioned and causing the image formation to be continued by the operation of the remaining good optical path deflection means and the light beam generating means corresponding to the good deflection means.

18. The light beam scanning apparatus according to claim 13, further comprising:

light beam position sensing means for sensing the light beams directed by the scanning means so that they may scan the surface of said image retaining member by means of light sensing elements arranged in parallel at intervals corresponding to resolutions in the direction almost perpendicular to the direction in which said light beams scan;

resolution conversion means for, when said malfunction sensing means has sensed that a malfunction has occurred in the light beam generating means, converting the resolution during image formation according to the number of the remaining good light beam generating means excluding the light beam generating means that has malfunctioned; and

control means for, when said malfunction sensing means has sensed that a malfunction has occurred in

the light beam generating means, stopping the light-emitting operation of the light beam generating means that has malfunctioned and causing the image formation to be continued at the resolution converted by said  
5 resolution conversion means by the operation of the remaining good light beam generating means.

19. A method of adjusting the sensing  
characteristic of a light beam luminous energy sensing  
section to a desired characteristic in an image forming  
10 apparatus for forming an image using a light beam  
optical system, comprising the steps of:

adjusting said light beam generating section so  
that the luminous energy of said light beam may have a  
specific value, while measuring the luminous energy of  
15 the light beam generated at the light beam generating  
section with a measuring device;

scanning a scan surface with a light beam  
generated at a light beam generating section;

sensing the luminous energy of the light beam  
20 scanning said scan surface with said light beam  
luminous energy sensing section in said apparatus and  
offering the sensing result; and

adjusting the signal amplification factor of said  
luminous energy sensing section so that said sensing  
25 result may coincide with a specific value.

20. The method according to claim 19, wherein the  
step of offering said sensing result includes the step

of displaying said sensing result on a display of the control panel of said apparatus.

21. An image forming apparatus which forms an image on an image retaining member by causing light beams to scan and expose the surface of said image retaining member, comprising:

light beam generating means for generating plural light beams;

image forming means for forming an image by scanning the surface of said image retaining member with the light beams generated at the plural light beam generating means;

malfunction sensing means for sensing that a malfunction has occurred in each of said plural light beams; and

control means for stopping a generation of the light beam among the plural light beams, that has malfunctioned, when the malfunction sensing means has sensed that a malfunction has occurred in the light beam, and causing the image formation to be continued by the operation of the remaining good light beam generating means.